UNIT 4

INTRODUCTION OF INPUT DEVICES

WHAT IS INPUT?

Input is any data or instructions entered to the computer. Input can be in the form of audio, video,graphics and animations and instructions

WHAT ARE INPUT DEVICES?

Any hardware component used to enter data, programs, commands, and user responses into acomputer

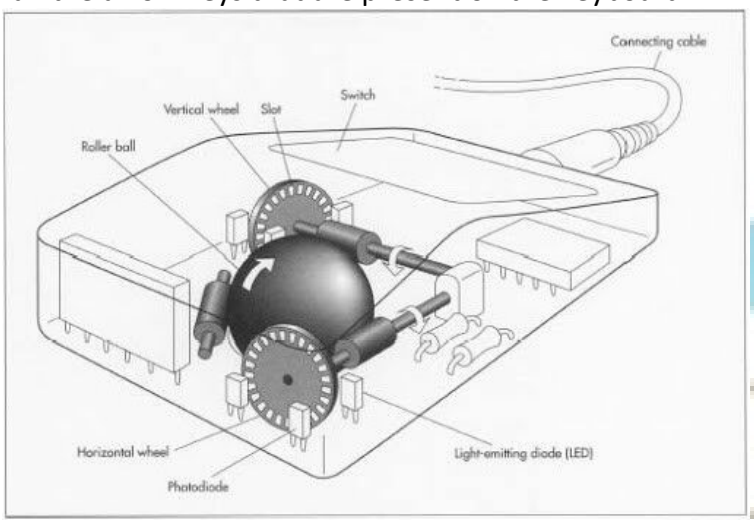
Examples: Key Board, Mouse, Digital Camera, Webcam, Scanner, etc.

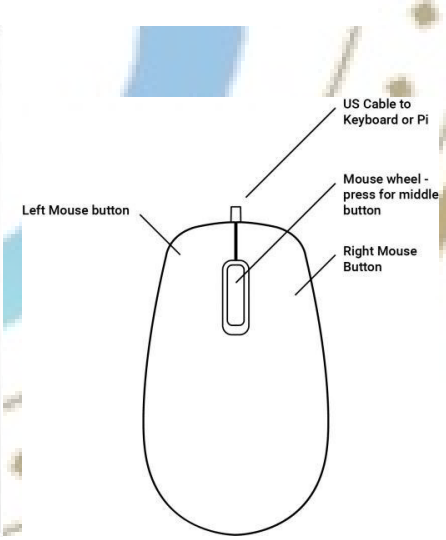
POINTING DEVICES

MOUSE

Mouse is most popular pointing device. It is a very famous cursor-control device having a small palm size box with a round ball at its base which senses the movement of mouse and sends corresponding signals to CPU when the mouse buttons are pressed. The cursor (pointing arrow) is controlled by the mouse. However, this device cannot be used to enter text into the computer.

These devices are easy to use, not very expensive to purchase and help in moving the cursor faster than the arrow keys that are present on the keyboard





Parts of a computer mouse

- **Buttons:** mouse has 2 buttons on the left and right. The left button is the normal (primary button) click button while the right button is used for more options.

- **Wheel:** it is in between the buttons. It is used to scroll documents up or down.
- **Cable/connector:** this is used on the wired mouse to connect to the system unit. For wireless mice, no cable is required.
- **Ball:** this used to be on the old types of mouse. They were used to give the coordinate of the cursor at any particular time. It was linked to a sensor to detect the mouse position. It was replaced by other technologies such as an optical mouse.
- **LED or laser:** they generate light that is used to determine the position of the mouse hence the cursor movement.
- **Mouse motherboard:** it carries the mouse processor and other electronic components. It sends and receives signals from the computer motherboard to enable mouse system communication.

Types of Computer Mouse

- Wired Mouse.
- Wireless Mouse.
- Ball/Mechanical Mouse.
- Wheel/Scroll Mouse.
- Optical Mouse.
- Laser Mouse.
- Blue Track Mouse.

Uses of a computer mouse

- **Pointing items:** mouse is used to point to items on the screen. In most applications when an item is pointed it offers more details about that option.
- **Selecting:** mice can be used to select text content on any document. They are used to select only a specific part of text from the whole.
- **Drawing:** in CAD programs mouse can be used for drawing. It makes the work of drawing very simple and easy to execute.
- **Dragging and drop:** it can be used to move an icon, image, or element from one point on the screen to another point.
- **Scrolling up and down of document or screen:** mouse is used to move screen content either up or down. The mouse wheel is used for this function.
- **Clicking:** this is the main function of a mouse. Click is used to open the file, execute a command, and view more options among other things.
- **Hovering:** this means moving the mouse over an object to get an effect. For example, when you hover the mouse over a webpage link it changes the type of mouse icon.
- **Playing games:** mouse is used to execute different moves in a computer game.

TRACKBALL

Track ball is an input device that is mostly used in notebook or laptop computer, instead of a mouse. This is a ball which is half inserted and by moving fingers on ball, pointer can be moved.

Since the whole device is not moved, a track ball requires less space than a mouse. A track ball comes in various shapes like a ball, a button and a square.



Advantages of using a trackball are:

- Less work surface is required for trackball to function.
- The trackball allows continuous and fast scrolling and does not require repositioning.

Disadvantages of using a trackball are:

- Compared to mouse, trackballs are physically larger.
- As they are little more expensive

JOYSTICK

Joystick is also a pointing device which is used to move cursor position on a monitor screen. It is a stick having a spherical ball at its both lower and upper ends. The lower spherical ball moves in a socket. The joystick can be moved in all four directions(rotates in the east, west, north and south).

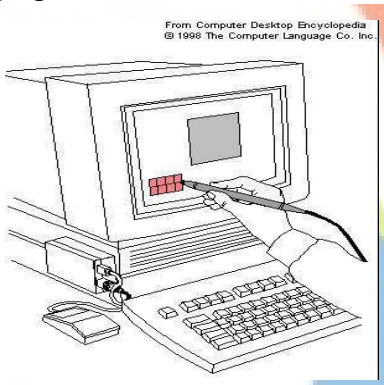
Three types of Motion: forward, backward and side
Type of joystick: **Digital Joystick, Paddle Joystick, Analog joystick, PC analog Joystick**
Use: It is mostly used in playing computer game in computer and other use are in cranes, trucks, wheelchairs, surveillance cameras, underwater unmanned vehicles, airplanes, etc. Joysticks are used.

TOUCH SCREEN

As the term indicates, a touch screen or display screen is a device like a tablet or a smartphone. This device allows users to directly interact or provide inputs to the device by using a finger. Now a day, most of the electronic devices come equipped with a touch screen. This is often an alternative to a mouse for navigating a graphical user interface.
For example, one can unlock phones, open emails, open files, play video and perform other tasks by just a single touch. There are also other devices like car GPS, camera and fitness machines.
Advantages: Easy to use, Save space, Speed

LIGHT PEN

Light pen is a pointing device which is similar to a pen. It is used to select a displayed menu item or draw pictures on the monitor screen. It consists of a photocell and an optical system placed in a small tube. When the tip of a light pen is moved over the monitor screen and pen button is pressed, its photocell sensing element detects the screen location and sends the corresponding signal to the CPU.



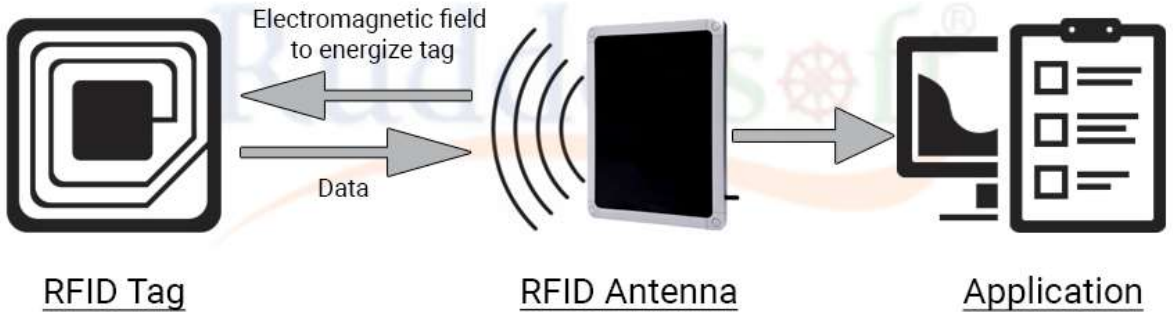
KEYBOARD

Keyboard is the most common and very popular input device which helps in inputting data to the computer. The layout of the keyboard is like that of traditional typewriter, although There are some additional keys provided for performing additional functions. Keyboards are of two sizes 84 keys or 101/102 keys, but now keyboards with 104 keys or 108 keys are also available for Windows and Internet.

Sr.No	Keys	Description
1	Typing Keys	These keys include the letter keys (A-Z) and digit keys (0-9) which generally give same layout as that of typewriters.
2	Numeric Keypad	It is used to enter numeric data or cursor movement. Generally, it consists of a set of 17 keys that are laid out in the same configuration used by most adding machines and calculators.
3	Function Keys	The twelve function keys are present on the keyboard which are arranged in a row at the top of the keyboard. Each function key has unique meaning and is used for some specific purpose.
4	Control keys	These keys provide cursor and screen control. It includes four directional arrow keys. Control keys also include Home, End, Insert, Delete, Page Up, Page Down, Control(Ctrl), Alternate(Alt), Escape(Esc).
5	Special Purpose Keys	Keyboard also contains some special purpose keys such as Enter, Shift, Caps Lock, Num Lock, Space bar, Tab, and Print Screen.

RFID CONCEPTS AND APPLICATION IN FASTTAG

The RFID technology uses an Electronic Produce Code (EPC) through which every vehicle can be uniquely identified. This code is different from the vehicle's registration number and exclusive to it on a global scale. Each EPC code, which is a 13-digit number, in the RFID-FASTag is issued by GS1 India, a standards body, which ensures that each code is unique and in sync with the global standards put in place, in order for correct product identification. Which in the case of FASTag, is a vehicle. The code needs to be standardized in order to ensure that the data coded inside is not read differently at different levels.



An RFID tag uses a small electronic chip for the same which is surrounded by an antenna. Also, unlike the barcode, an RFID tag does not need to be very close to the reader or, even in the line of sight of the same. One just simply has to be within a reading distance from the scanner.
A FASTag has what is called a passive RFID chip as it does not contain its own battery. It is energized only when the beam from the scanner strikes it. At a toll plaza, when a vehicle comes within a certain radius, the scanner is able to send out the signals and read the tag which means, the identification code of the vehicle. Since a FASTag is pre-charged with money, it hits the payment that is inside the tag and deducts the toll amount. All of this is done in an automated way, without the vehicle stopping, or the toll operator touching the tag itself.

INTRODUCTION AND PURPOSE OF SCANNING DEVICES

OPTICAL SCANNER

An optical scanner is an input device using light beams to scan and digitally convert images, codes, text or objects as two-dimensional (2D) digital files and sends them to computers and fax machines. Flatbed scanning devices are the most popular optical scanners.

Optical scanners are used for many purposes, including reading customized response forms, creating automated data fields and recording fingerprints. Optical scanners cannot differentiate between text and graphics.

Thus, all scanned content is converted to bitmap images, and scanned text cannot be edited. Optical character recognition (OCR) systems translate images of handwritten, typewritten or printed text into American Standard Code for Information Interchange (ASCII) characters. Most modern optical scanners are standard OCR package components.

Optical scanners normally include proprietary software for consistent imaging. They attach to computing devices using external input/output (I/O) channels such as universal serial bus (USB), wireless adapters etc.

BAR CODE READER

A barcode reader, also called a price scanner or point-of-sale (POS) scanner, is a hand-held or stationary input device used to capture and read information contained in a bar code . A barcode reader consists of a scanner , a decoder and a cable used to connect the reader with a computer. Because a barcode reader captures and translates the barcode into numbers and/or letters, the data must be sent to a computer so that a software application can make sense of the data. Barcode scanners can be connected to a computer through a serial port. A barcode reader works by directing a beam of light across the bar code and measuring the amount of light that is reflected back. (The dark bars on a barcode reflect less light than the white spaces between them.) The scanner converts the light energy into electrical energy, which is then converted into data by the decoder and forwarded to a computer.

There are five basic kinds of barcode readers -- pen wands, slot scanners, Charge-Couple Device (CCD) scanners, image scanners, and laser scanners.

- A pen wand is the simplest barcode reader. It contains no moving parts and is known for its durability and low cost. A pen wand can present a challenge to the user, however, because it has to remain in direct contact with the bar code, must be held at a certain angle, and has to be moved over the bar code at a certain speed.
- Slot scanners are typically used to scan bar codes on identification cards.
- A CCD scanner has a "gun" type interface and has to be held no more than one inch from the bar code.
- An image scanner, also called a camera reader, uses a small video camera to capture an image of the bar code and then uses sophisticated digital image processing techniques to decode the bar code. It can read a bar code from about 3 to 9 inches away and generally costs less than a laser scanner.
- A laser scanner, either hand-held or stationary, does not have to be close to the bar code in order to do its job. The scanner read the bar code regardless of orientation, and can easily

read a bar code up to 24 inches away

WEB CAMERA(WEBCAM)

A webcam is a small digital video camera directly or indirectly connected to a computer or a computer network.

Webcams come with software that needs to be installed on the computer to help users record video on or stream it from the Web. Webcams are capable of taking pictures as well as high-definition videos, although the video quality can be lower compared to other camera models.

A webcam is an input device that captures digital images. These are transferred to the computer. The features of a webcam are largely dependent on the software operating system of the computer as well as the computer processor being used. Webcams can have additional features such as motion sensing, image archiving, automation or even custom coding.

Webcams are mostly used in videoconferencing and for security surveillance. Other uses include video broadcasting, social video recording and computer vision.

INTRODUCTION AND COMPARISONS OF OUTPUT DEVICES

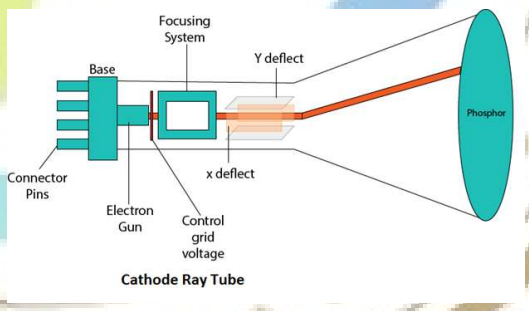
MONITORS

A monitor is an electronic output device that is also known as a video display terminal (VDT) or a video display unit (VDU). It is used to display images, text, video, and graphics information generated by a connected computer via a computer's video card.

Types of monitors: LED, LCD, TFT, OLED, Touchscreen Monitor

CRT MONITORS (CATHODE RAY TUBE)

It is a technology used in early monitors. It uses a beam of electrons to create an image on the screen. It comprises the guns that fire a beam of electrons inside the screen.



Cathode Ray Tube

The electron beams repeatedly hit the surface of the screen. These guns are responsible for generating RGB (Red, Green, Blue) colors, and more other colors can be generated with the help of combining these three colors. Today's Flat Panel Monitors replace the CRT monitors.

LIGHT EMITTING DIODE (LED):

LED monitor is a flat screen computer monitor, which stands for light-emitting diode display. It islightweight in terms of weight and has a short depth.
As the source of light, it uses a panel of LEDs. Nowadays, a wide number of electronic devices, both large and small devices such as laptop screens, mobile phones, TVs, computer monitors, tablets, andmore, use LED displays

Advantage

- LED have very long life.
- It requires low maintenance.
- LED doesn't produce heat.
- LED is highly efficient.

Disadvantage:

- It is more costly.
- It have restricted viewing angle.

LIQUID CRYSTAL DISPLAY (LCD):

The LCD monitors bring lots of advantages when compared to the CRT ones. The first advantage which is also the most obvious one is the fact that the LCD monitors are smaller and have a smallerweight than the CRT monitors.
The LCD monitors can be placed on the table and they use far less space than the CRT monitors. Thisis a great advantage. The picture quality of the LCD monitors will be increased as well which means that the movies will be displayed in a better quality and the games will have better colors, and so on.

Advantage:

- It consumes less power.
- It includes millions of colors.
- It is lighter than LED.

Disadvantage:

- It needs extra light sources.
- It have also restricted viewing angle.
- Its speed is very slow.

THIN-FILM TRANSISTOR(TFT):

It is a type of LCD flat panel display, which stands for a thin-film transistor. In TFT monitors, all pixelsare controlled with the help of one to four transistors.

The high-quality flat-panel LCDs use these transistors. Although the TFT-based monitors providebetter resolution of all the flat-panel techniques, these are highly expensive.

The LCDs, which use thin-film transistor (TFT) technology, are known as active-matrix displays. Theactive-matrix displays offer higher quality as compared to older passive-matrix displays.

Advantage:

- Minimal energy consumption
- Sharp visibility
- Fast and accurate response time
- Minimizes eye strain
- Space efficient design (can be placed anywhere in your workspace on a rotational mount so you can turn it in all directions)

Disadvantage:

- Higher price point than other displays
- Disproportionate viewing angles
- Restricted utility due to glass paneling
- Relies on backlighting to provide brightness rather than producing its own light, hence, they need built-in light emitting diodes (LEDs) in their backlighting structure

ORGANIC LIGHT EMITTING DIODE(OLED):

It is a new flat light-emitting display technology, which is more efficient, brighter, thinner, and betterrefresh rates feature and contrast as compared to the LCD display.

These displays do not need a backlight as they are emissive displays. Furthermore, it provides betterimage quality ever and used in tablets and high-end smartphones.

Nowadays, it is widely used in laptops, TVs, mobile phones, digital cameras, tablets, VR headsets.

Advantages:

➡Flexible and hence it is very easy to manufacture

➡OLED consumes less power and are suitable for devices requiring less power consumption such as android phones, portable gaming consoles, media players, digital cameras etc.

➡It provides remarkable color fidelity, high efficiency and operational stability.

➡They are very thin and small in size and hence are light in weight.

Disadvantage:

➡Their lifetime is shorter compare to other display types.

➡It is expensive compare to LCD.

➡It is susceptible to water and hence it can be easily damaged by water.

➡OLED screens are even worse compare to LCD when subjected to direct sunlight.

TOUCH SCREEN:

These monitors are also known as an input device. It enables users to interact with the computer byusing a finger instead of using a mouse or keyboard.

When users touch the screen by their finger, it occurs an event and forward it to the controller forprocessing.

These types of screens include pictures or words that help users to interact with the computer. Ittakes input from the users by touching menus or icons presented on the screen.

Advantage:

➡It is easy for inexperienced user to learn and operate with the help of touch of any one of the fingers.

➡It saves lot of space and avoids external devices such as keyboard or mouse.

➡It provides quick and efficient selection of menu options.

➡The interface is very easy to maintain as no dirt gets accumulated.

➡It is easy to change the GUI on the touch screen interface with the help of software upgrades.

➡It offers very high durability and reliability.

Disadvantages:

➡Accuracy and precision depend on size of the icons. When icons are very small, it may be difficult to activate the same with the help of large fingers.

➡. User must be within reach of the touch screen display.

➡Hands and fingers often obscure the screen information while selecting the desired options.

➡Battery operated touch screen devices consume more power.

➡It is difficult to operate by visually impaired people.

➡It is very sensitive interface and hence can also be activated due to stray touches.

PRINTERS

Printer is an output device, which is used to print information on

paper.There are two types of printers −

1. Impact Printers

2. Non-Impact Printers

1. IMPACT PRINTERS

Impact printers print the characters by striking them on the ribbon, which is then pressed on thepaper. These printers are of two types − Character printers, Line printers. (Dot Matrix printer)

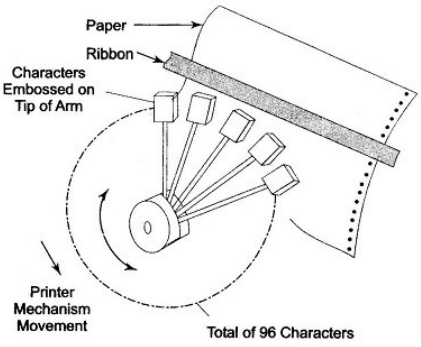
2. NON-IMPACT PRINTERS

Non-impact printers print the characters without using the ribbon. These printers print a completepage at a time, thus they are also called as Page Printers. (Laser printer, Inkjet printer)

DOT MATRIX PRINTER:

A dot matrix printer (DMP) is a type of printer which uses pins impacting an ink ribbon to print. These printers are generally considered outdated, as they cannot create high-quality prints and are costly as well.

However, they have a certain specialty that other printers like inkjet and laser printers do not have: as they use impact for printing, they can be used to print multiple copies of text at the same time with the help of carbon copying. Therefore, they are mostly used in places where multipart forms are required.



A dot matrix printer is also known as an impact matrix printer

In a dot matrix printer, the characters and letters are formed by a matrix of dots. A print head, which has many pins in it, moves in the required direction and strikes against a cloth ribbon which is soaked in ink, making a mark on the paper.

The dots are spaced closely in a particular shape to make the intended character. This looks quite similar to the printing mechanism of typewriters. A character printed by a DMP is actually an accumulation of many such dots on a small area of the paper.

Many dot matrix printers are bidirectional, that is, they can print the characters from left to right and right to left.

ADVANTAGES

- Inexpensive
- Widely Used
- Other language characters can be printed

DISADVANTAGES

- Slow Speed
- Poor Quality

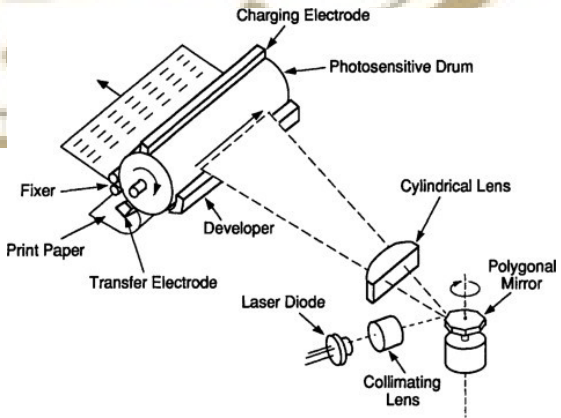
LASER PRINTER:

A laser printer is a printer that uses a focused beam or light to transfer text and images onto paper. Though contrary to popular belief, the laser does not actually burn the images onto the paper.

Instead, as paper passes through the printer, the laser beam fires at the surface of a cylindrical drum called a photoreceptor. This drum has an electrical charge (typically positive), that is reversed in areas where the laser beam hits it. By reversing the charge in certain areas of the drum, the laser beam can print patterns (such as text and pictures) onto the photoreceptor.

Once the pattern has been created on the drum, it is coated with toner from a toner cartridge. The toner is black in most cartridges, but may be cyan, magenta, and yellow in color laser printers. The positively charged toner clings to areas of the drum that have been negatively charged by the laser. When the paper passes through the printer, the drum is given a strong negative charge, which allows the toner to transfer and stick to the paper. The result is a clean copy of the image written on the paper.

Because laser printers do not use ink, they have less image smearing problems than inkjet printers and are able to print pages faster. While laser printers and toner



cartridges typically cost more than inkjet printers and ink cartridges, most laser toner cartridges last several times longer than ink cartridges, which makes their cost per page about equal. For this reason, businesses tend to use laser printers, while consumers are more likely to use inkjet printers. Laser printers typically have a resolution of 600 dpi (dots per inch) or higher.

ADVANTAGES

- Very high speed
- Very high quality output
- Good graphics quality
- Supports many fonts and different character size

DISADVANTAGES

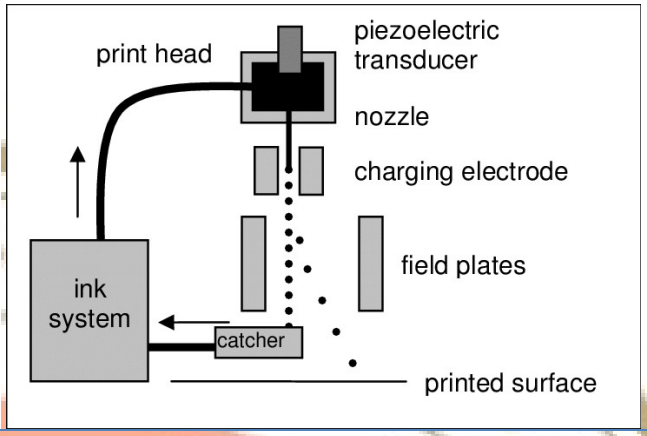
- Expensive

Cannot be used to produce multiple copies of a document in a single printing

INKJET PRINTER

Inkjet printers are the most common type of consumer printers. The inkjet technology works by spraying very fine drops of ink on a sheet of paper. These droplets are "ionized" which allows them to be directed by magnetic plates in the ink's path. As the paper is fed through the printer, the print head moves back and forth, spraying thousands of these small droplets on the page.

While inkjet printers used to lack the quality and speed of laser printers, they have become almost as fast as laser printers and some can even produce higher-quality images. Even low-budget inkjet printers can now print high-resolution photos. The amazing thing is, as the quality of inkjet printers has improved, the prices have continued to drop. However, for most people, refilling the inkjet cartridges a few times will often cost more than the printer.



ADVANTAGES

- High quality printing
- More reliable

DISADVANTAGES

- Expensive as the cost per page is high

Slow as compared to laser printer